Serial No. 10/680,836
Bickham et al
Case No. CE10048R

Amendments to the Claims:

1. (Currently Amended) A radio frequency power device module comprising:

- an active radio frequency power device having a control signal input;

- digital control logic formed integral to the active radio frequency power device and having:

- an information input; and

- a control signal output that is operably coupled to the control signal input of the active radio frequency power device;

- a free-space optical communications interface formed integral to the active radio frequency power device and having a received signal output that is operably coupled to the information input of the digital control logic; and

- wherein the active radio power device, digital control logic and free-space optical communication interface are housed in a common enclosure such that an optical link is formed within the enclosure between the active radio power device and the digital control logic.

2. (Original) The radio frequency power device module of claim 1 and further comprising:

- an operational status detector formed integral to the active radio frequency power device and having:

- an input that is responsive to an operational state of the active radio frequency power device; and

- a detected status output that is operably coupled to an input of the free-space optical communications interface.

3. (Original) The radio frequency power device module of claim 2 wherein the operational state comprises at least one of:

- a direct current value that is associated with the active radio frequency power device;

- a radio frequency power condition that is associated with the active radio frequency power device; and

- a thermal state that is associated with the active radio frequency power device.

4. (Original) The radio frequency power device module of claim 3 wherein the direct current value comprises a bias level.

5. (Original) The radio frequency power device module of claim 3 wherein the radio frequency power condition comprises at least one of forward and reflected power levels.

6. (Original) The radio frequency power device module of claim 2 and further comprising a data formatter that is operably coupled between the detected status output of the operational status detector and the input of the free-space optical communications interface.

7. (Original) The radio frequency power device module of claim 1 wherein the active radio frequency power device comprises at least one of:

- a radio frequency power amplifier;
- a radio frequency power transistor;
- an LDMOS transistor.

8. (Original) The radio frequency power device module of claim 1 wherein the free-space optical communications interface comprises an emitter structure and a separate detector structure that are each implemented at least in part in a monocrystalline Group III-V compound semiconductor substrate layer.

9. (Original) The radio frequency power device module of claim 1 and further comprising:

- at least one controller formed integral to the active radio frequency power device and having:

- an input that is operably coupled to an output of the free-space optical communications interface; and

- a control signal output that is operably coupled to the control signal input of the active radio frequency power device.

10. (Currently Amended) A method comprising, in a single integrated device:

- operating an active radio frequency power device;

- monitoring, from within the single integrated device, at least one operational state as regards the active radio frequency power device to provide resultant monitoring information electrical signals;

- converting, from within the single integrated device, the resultant monitoring information electrical signals to resultant monitoring information optical signals and transmitting the resultant monitoring information optical signals in optical free-space from a free-space optical communication interface to a digital control logic formed integral to the active frequency power device and wherein the active radio power device, digital control logic and free-space optical communication interface are housed in a common enclosure such that an optical link is formed within the enclosure between the active radio power device and the digital control logic.

11. (Original) The method of claim 10 wherein monitoring, from within the single integrated device, at least one operational state as regards the active radio frequency power device comprises monitoring, from within the single integrated device, at least one operational state as regards the active radio frequency power device wherein the at least one operational state comprises at least one of:

- a direct current value that is associated with the active radio frequency power device;

- a radio frequency power condition that is associated with the active radio frequency power device; and

- a thermal state that is associated with the active radio frequency power device.

12. (Original) The method of claim 10 and further comprising:

- receiving optical free-space feedback control signals at the single integrated device;

- using the optical free-space feedback control signals to influence operation of the active radio frequency power device.

13. (Original) The method of claim 10 and further comprising:

- providing the active radio frequency power device;

- providing a free-space optical communications interface formed integral to the active radio frequency power device;

and wherein transmitting the resultant monitoring information optical signals in optical free-space comprises using the free-space optical communications interface to transmit the resultant monitoring information optical signals in optical free-space.

14. (Original) An apparatus for telecommunications, comprising an RF power device module and a digital control unit, in operable communication with each other, wherein:

i) the RF power device module comprises:

a) an RF power device chip, comprising:

an RF power component;

a detection arrangement comprising at least one of:

a DC detector operable to detect a direct current value associated with the RF power component and outputting a first electronic signal proportional to the detected current value to a formatting circuit,

an RF detector operable to detect an RF power condition associated with the RF power component and outputting a second electronic signal corresponding to the detected RF power condition to the formatting circuit; and

a thermal detector to detect a thermal state of the RF power component and outputting a third electronic signal corresponding to the detected thermal state to the formatting circuit;

a formatting circuit operable to reformat the first, second, and third electronic signals into data signals processable by an optical emitter/detector component;

an optical emitter/detector component operable to receive the signals outputted by the formatting circuit and transmit corresponding optical signals propagated through free space via a bi-directional optical link made with an optical signal detector/emitter component associated with diagnostic processing and control circuitry implemented on a separate chip from the RF power device chip;

b) a diagnostic processing and control device chip, physically separated from the RF power device chip, having an optical signal detector/emitter component associated with diagnostic processing and control circuitry adapted to interpret the signals received from the RF power device chip and feed back at least one of error and compensating signals to the RF power device chip via the bi-directional optical link; and

ii) a processor control unit adapted to further interpret the data signals received from the RF power device chip and feed back commands to the diagnostics processing and control chip for providing feed back signals to the RF power device chip effective to make an adjustment to an operating condition of the RF power device.

15. (Original) The apparatus of claim 14, wherein the apparatus comprises a base station.

16. (Original) The apparatus of claim 14, wherein the processor control unit is selected from a microprocessor control unit and a digital signal processing control unit.

17. (Original) The apparatus of claim 14, wherein the RF power device chip is contained in a package, and the package and the diagnostics processing and control chip are housed within a common enclosure.

18. (Original) The apparatus of claim 14, wherein the RF power component comprises an RF power amplifier.

19. (Original) The apparatus of claim 14, wherein the RF power component comprises an RF power transistor.

20. (Original) The apparatus of claim 14, wherein the RF power component comprises an LDMOS transistor.

21. (Original) The apparatus of claim 14, wherein the detection arrangement comprises each of the DC detector, the RF detector, and the thermal detector.

22. (Original) The apparatus of claim 14, wherein the detection arrangement comprises the RF detector, wherein the RF detector comprises at least one of a directional coupler and a voltage rectifier.

23. (Original) The apparatus of claim 14, wherein the detection arrangement comprises the DC detector, wherein the DC detector is operable to detect at least one of a quiescent current and a bias voltage level for a power amplifier.

24. (Original) The apparatus of claim 14, wherein the RF power chip further comprises a control circuit operably coupled to the RF power device and the processor control unit and being responsive to the feed back signals to effect the adjustment to the operating condition of the RF power device.

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